

## **BATHYGOBIUS KARACHIENSIS (GOBIIDAE), A NEW SPECIES FROM PAKISTAN**

by

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**ABSTRACT.** - *Bathygobius karachiensis* is described from the Karachi coast of Pakistan. The fish was found at depths ranging from 1 to 2 m. It is characterized by anterior and posterior oculoscapular canals interconnected (4 supra opercular pores); 35-36 scales along body; 14-15 transverse series of scales; cheek and opercle scaleless; predorsal scales 13-21 reaching slightly anterior to hind preopercular margin; a skinny flap on anterior nostril; pectoral fin with 5 upper rays free, each with 4-5 branches. Body and head brown; first dorsal fin with 4 rows of dark spots; 5 saddle-like blotches on back and upper part of flank; mid-lateral line with 7 elongate spots; a dark spot behind eye, another on base of free pectoral fin rays.

**RÉSUMÉ.** - *Bathygobius karachiensis* est décrit de la côte de Karachi, Pakistan, où il vit à des profondeurs de 1 à 2 mètres. Il est caractérisé par des canaux oculoscapulaires antérieurs et postérieurs interconnectés (4 pores supra-operculaires); 35-36 écailles le long du corps; 14-15 séries transverses d'écailles; des joues et opercules sans écailles; 13-21 écailles prédorsales cachant un peu le bord du préoperculaire; un clapet de peau fermant la narine antérieure; des nageoires pectorales avec 5 rayons supérieurs libres, avec chacun 4-5 branches; un corps et une tête marron; la première nageoire dorsale avec 4 lignes de points foncés; 5 taches en forme de selle sur le dos et la partie supérieure des flancs; 7 points allongés sur la ligne latérale médiane; un point foncé derrière l'oeil, un autre à la base des rayons libres de la nageoire pectorale.

Key-words: Gobiidae, *Bathygobius karachiensis*, ISW, Pakistan, Taxonomy, New species.

The species of the genus *Bathygobius* are found throughout the Indo-Pacific and Atlantic areas populating the various habitats of the littoral zone. The species of this genus are similar to each other in colour patterns as well as in many meristic counts, thus leading to a confusion in the literature concerning the systematics and zoogeography of these species. This confusion is particularly evident in Koumans (1953), who listed more than 40 different synonyms of *B. fuscus* Rüppell (many of them considered today as valid species). A survey of recent publications (last 10 years), yielded 12 species recorded in the Indo-Pacific region: *B. fuscus* (Rüppell), *B. laddi* (Fowler), *B. cyclopterus* (Valenciennes), *B. cocosensis* (Bleeker), *B. albopunctatus* (Valenciennes), *B. meteori* (Klausewitz), *B. cotticeps* (Steindachner), *B. padangensis* (Bleeker), *B. petrophilus* (Bleeker), *B. fishelsoni* Goren, *B. niger* (Smith), *B. honkongensis* Chiu, and 2 undescribed species (Goren, 1978, 1988; Akihito and Meguro, 1980; Hoda, 1980; Akihito et al., 1984; Winterbottom and Emery, 1985; Hoese, 1986; Chiu, 1986). An additional species *B. karachiensis*, was named by Hoda (1981) without any description (nomen nudum) and later partly described as *B. albopunctatus* (Hoda, 1984). The description of the species was based on several specimens collected in Karachi. However, none of them was designated as a type.

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The aim of this paper is to establish the validity of *B. karachiensis* by designating types for this species, as well as to describe the species on the basis of the results of a study of 70 specimens.

## MATERIALS AND METHODS

Measurements and counts were made following Hubbs and Lagler (1958), and sensory pores and papillae as in Akihito and Meguro (1980) and Akihito (1986). Longitudinal scale counts were made from the upper attachment of the opercular membrane to the hypural, and transverse scales counted anterodorsally from the origin of anal spine. Standard length was measured from snout tip to the end of the hypural; total length from the snout tip to the end of the caudal fin; head length from snout tip to upper attachment of the opercular membrane.

Alizarine Red S was employed for the study of bony structures.

Formula of first dorsal pterygiophores as suggested by Birdsong *et al.* (1988).

The specimens are deposited in the fish collection of the Centre of Excellence in Marine Biology, University of Karachi, Pakistan (CEMBP) and the fish collection of the Zoological Museum of Tel Aviv University (TAU). Abbreviations: SL = standard length; TL = total length.

## *BATHYGOBIUS KARACHIENSIS* SP. N.

(Figs 1, 2)

*Bathygobius karachiensis* Hoda (as nomen nudum), Proc. Second Pakistan Congress of Zoology, 1981: 25.

*Bathygobius albopunctatus* Hoda (part.), 1984, *Biologia*, 30(2): 287-295, 2 figs.

### Material examined

*Holotype*: TAU 10184, male, TL 70 mm, SL 56 mm, Buleji, Karachi coast, Pakistan, tide pools around rocks and sandy bottom, 1-2 m deep, 10.3.1983. Coll. S. M. S. Hoda.

*Paratypes*: TAU 10185 1 spec., TAU 10185 1 spec., CEMBP 67 spec.: 34 males, 34-67 mm SL; 35 females, 31-57 mm SL, data as for holotype, 28.6.1979, 11.3.1981, 10.3.1983.

*Comparative material*: *B. hongkongensis* TAU 10231, 2 spec., TL 36-40 mm, SL 30-33 mm, Hong Kong, Coll. L. Chiu, 29.11.1984; TAU 9280, 2 spec., TL 36-38 mm, SL 30-32 mm, Hong Kong, Coll. L. Chiu, 23.11.84.

### Holotype measurements

TL, 70 mm; SL, 56 mm; head length, 17 mm; head width, 15 mm; head height, 17 mm; snout, 4 mm; eye orbit, 4 mm; post orbital length, 9 mm; snout to first dorsal fin, 20 mm; snout to second dorsal fin, 30 mm; snout to anal fin origin, 33 mm; snout to anus, 30 mm; base of first dorsal fin, 7 mm; second dorsal fin, 14.5 mm; anal fin, 10.5 mm; maximum height of first dorsal fin, 7.5 mm; second dorsal fin, 7.5 mm; body depth at anal fin origin, 10.5 mm; caudal peduncle depth, 7.5 mm; caudal length, 13 mm; pectoral fin, 16 mm; ventral fin, 11 mm; ventral to anus, 12.5 mm; fraenum to end of ventral fin, 7.5 mm; end of ventral fin to anal fin origin, 5 mm; fraenum to anus, 10 mm.

### Etymology

Named after the city Karachi.





Fig. 1: *Bathygobius karachiensis*, holotype (TAU 10184), male, 56 mm SL.

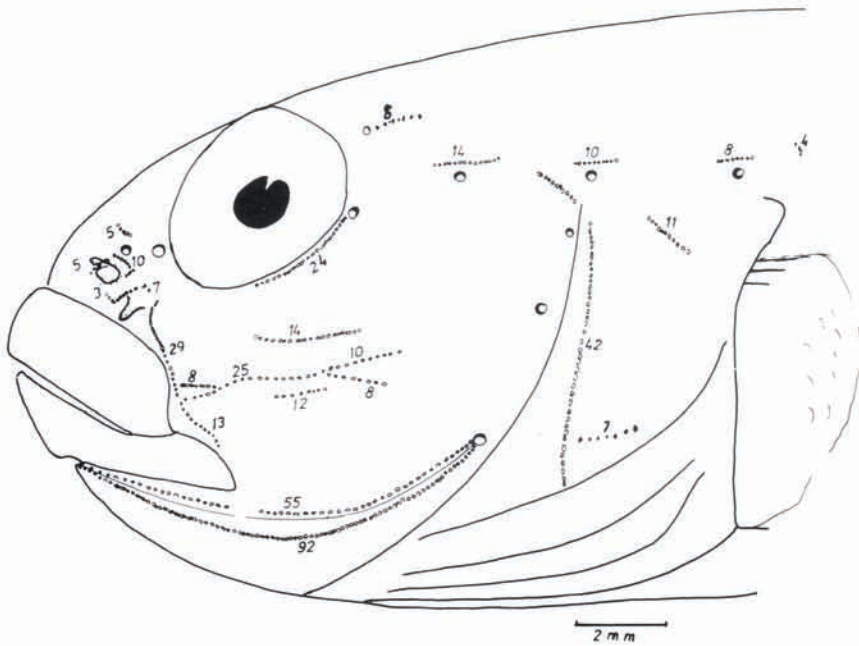


Fig. 2: Cephalic sensory system of the holotype of *Bathygobius karachiensis*. Figures along pit organs indicate approximate number of papillae.

### Diagnosis

A brown *Bathygobius* with anterior and posterior oculoscapular canals connected to each other (4 supra opercular pores). Cephalic sensory papillae as in Figure 2. Scales along the body, 35-36; transverse series of scales, 14-15; cheek and opercle scaleless; preventral with cycloid scales, pectoral base 3-4 rows of cycloid scales; predorsal scales 13-21 reaching slightly anterior to hind preopercular margin; a skinny flap on anterior nostril; mental flap short lateral lobes deep, 5 upper pectoral rays free each with 4-5 branches. 5 saddle-like blotches from dorsal side not exceeding mid trunk. Mid-lateral line with 7 small elongate spots, one dark spot behind eye, another at base of free pectoral rays.

### Description

The description is based on holotype and 69 paratypes (34 males and 35 females).

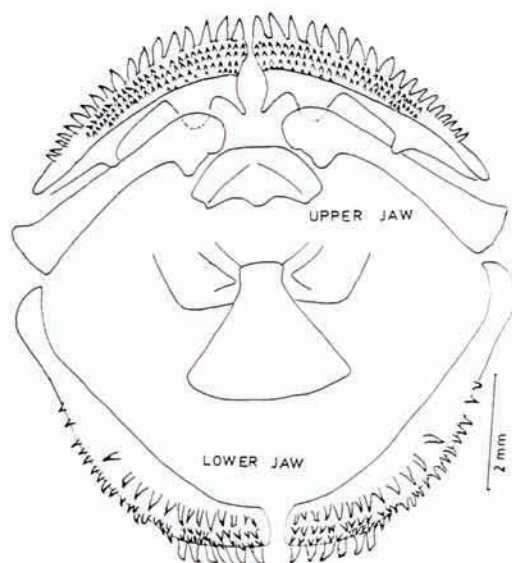


Fig. 3: Jaws of *Bathygobius karachiensis*, male 58 mm SL.

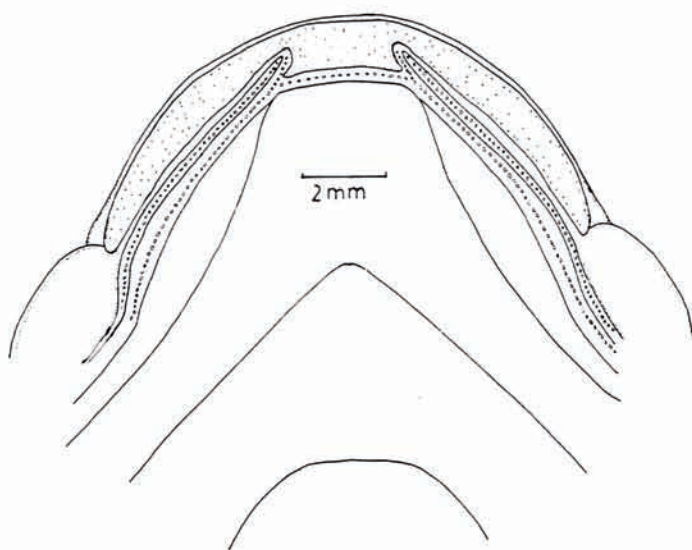


Fig. 4: Mental flap of the holotype of *Bathygobius karachiensis*.

Body elongate, head flattened, posteriorly compressed. Mouth terminal, maxillary reaches to a vertical from anterior third of eye. Lower jaw with 4 rows of teeth, outer and inner teeth are enlarged and curved backward. Upper jaw with large teeth at outer row followed by 4 rows of small teeth (Fig. 3). Tongue bilobed. skinny flap at anterior nostril. Postero-lateral edge of mental flap rather deep,

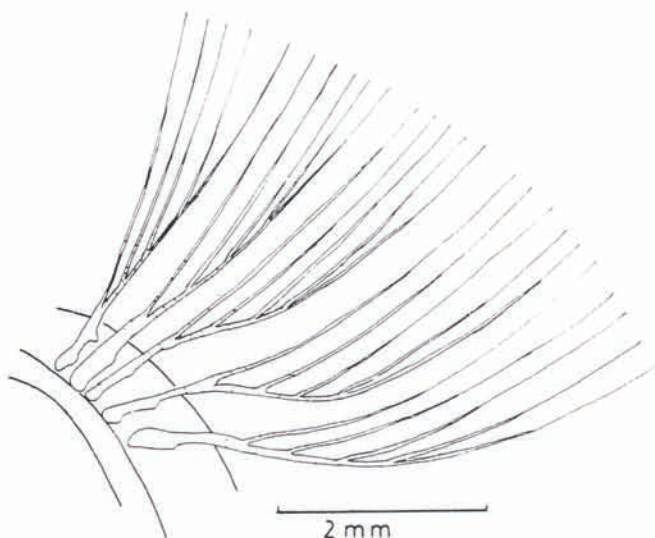


Fig. 5: Free pectoral fin rays of *Bathygobius karachiensis*, male, 58 mm SL.

protruding (Fig. 4). Eyes of moderate size, interorbital space narrow - 45-55% of eye diameter; gill opening reach to below pectoral base. Gill rakers 0+1+7.

**Fins:** dorsal fins VI-I,9; anal fin I,8; pectoral fins 21-22 (16-17 + 5 upper free rays). Each free ray divided into 5, occasionally 4 on first anteriormost free ray (Fig. 5). Pelvic fins I,5, fully united. Fraenum smooth, bilobed with a deep notch between spine and soft ray of pelvic fin. The distance from fraenum to end of ventral fin slightly longer than the distance from end of ventral fin to origin of anal fin.

**Scales:** body covered with ctenoid scales to a line from anterior origin of dorsal fin to above mid opercle. Scales anteriorly to this line as well as those on pectoral and pelvic bases are cycloid. Scales along the body 35-36 plus 3 scales on caudal fin base; transverse series of scales 14-15. Caudal peduncle with 7-8 rows of scales. Cheek and opercle naked. Predorsal scales 13-21 extending anteriorly to hind preopercular margin. Vertebrae number, 27 (10+17) including urostyle. Formula of first dorsal pterygiophores: 3-22110.

Genital papillae of the males are elongate and pointed and those of females are broader, flat, with skinny lobes around the opening (Fig. 6).

**Cephalic lateral-line system:** position and number of pores and papillae as shown in Figure 2. Anterior and posterior oculo-scapular canals are connected to each other.

Body proportions are presented in Table I. As evident from this table, there are some statistically significant differences between the sexes.

#### Coloration

Head and body brown, with irregular mottling on head and five discernible saddle-like dark brown blotches running till mid-lateral line of the body, not exceeding ventrally; first blotch anterior to first dorsal fin, second below first dorsal fin, third below anterior rays of second dorsal fin, fourth below posterior rays of second dorsal fin and fifth at caudal base; 7 small elongate black spots along the mid-lateral line of the body. First dorsal fin spines with four rows of black spots, interspinous membrane light yellow with minute spots, margined with black; second dorsal fin rays with 7-8 oblique rows of black spots, membrane light yellow



Table I: Body proportions and meristic counts of *Bathygobius karachiensis* Values given are: range, mean, standard deviation (S.D.) and t statistic ('t').

Characters	Male N=34		Female N=35		t
	Range	Mean $\pm$ S.D	Range	Mean $\pm$ S.D.	
In % of TOTAL LENGTH					
Standard length	77.27-85.07	80.91 $\pm$ 1.78	77.50-85.71	81.72 $\pm$ 2.45	1.57
In % of STANDARD LENGTH					
Head length	28.07-33.33	30.85 $\pm$ 1.24	29.73-34.57	31.27 $\pm$ 1.74	1.428
Head width	19.44-25.53	23.28 $\pm$ 1.53	17.74-25.53	21.92 $\pm$ 1.76	3.42 *
Head height	16.47-21.97	19.58 $\pm$ 1.35	15.79-20.93	18.25 $\pm$ 0.18	5.69 *
Snout	6.33- 9.09	7.50 $\pm$ 0.83	5.41- 8.10	6.94 $\pm$ 0.85	2.76 *
Eye	6.90-11.11	8.78 $\pm$ 1.02	8.00-11.43	9.22 $\pm$ 0.89	2.96 *
Post-orbital	14.58-18.03	16.06 $\pm$ 1.02	14.00-17.74	15.72 $\pm$ 0.76	1.56
Snout to first dorsal fin	28.91-38.82	35.96 $\pm$ 1.82	36.00-40.74	37.40 $\pm$ 1.45	3.63 *
Snout to second dorsal fin	52.88-62.22	56.43 $\pm$ 1.82	54.00-61.73	57.13 $\pm$ 1.73	1.64
Snout to anal fin	54.29-62.93	60.37 $\pm$ 2.44	55.71-65.43	60.85 $\pm$ 2.25	0.85
Snout to anus	49.37-63.33	54.33 $\pm$ 2.49	51.22-61.29	54.92 $\pm$ 1.98	1.09
Base of first dorsal fin	13.16-19.71	17.78 $\pm$ 1.84	14.29-20.00	17.85 $\pm$ 1.65	0.17
Base of second dorsal fin	23.08-28.82	24.78 $\pm$ 1.70	21.05-25.81	23.33 $\pm$ 1.25	4.03 *
Base of anal fin	15.19-20.88	18.15 $\pm$ 1.72	15.79-17.54	16.65 $\pm$ 0.60	4.81 *
Height of first dorsal fin	13.33-25.20	18.14 $\pm$ 1.72	13.16-18.70	15.45 $\pm$ 1.50	6.92 *
Height of second dorsal fin	11.76-18.60	14.39 $\pm$ 1.51	9.68-15.12	12.32 $\pm$ 1.09	6.51 *
Height of anal fin	11.48-15.45	13.50 $\pm$ 1.17	11.29-14.42	12.90 $\pm$ 0.98	2.31 *
Body depth at pectoral fin	15.19-21.82	19.42 $\pm$ 1.60	15.79-22.35	18.44 $\pm$ 1.78	2.41 *
Body depth at anal fin	13.54-20.21	18.63 $\pm$ 1.74	15.79-20.21	18.62 $\pm$ 1.35	0.03
Caudal peduncle depth	10.42-14.55	12.76 $\pm$ 0.58	10.53-13.95	12.21 $\pm$ 0.79	3.30
Caudal fin length	16.07-26.47	23.11 $\pm$ 2.18	19.23-27.03	23.70 $\pm$ 1.91	1.194
Pectoral fin length	22.81-29.59	27.02 $\pm$ 1.64	23.76-32.10	28.37 $\pm$ 2.22	2.88 *
Ventral fin length	17.54-27.59	21.31 $\pm$ 2.05	19.23-30.65	22.16 $\pm$ 2.54	1.53
Ventral fin origin to anus	20.25-27.94	24.42 $\pm$ 2.10	21.28-28.24	25.12 $\pm$ 2.06	0.400
Fraenum to end of ventral fin	12.50-19.44	14.53 $\pm$ 1.75	11.88-17.50	15.25 $\pm$ 1.53	1.82
End of ventral fin to anal fin	10.47-15.79	13.03 $\pm$ 1.42	10.00-15.71	13.27 $\pm$ 1.56	0.67
Fraenum to anus	15.38-21.82	19.33 $\pm$ 1.73	17.74-23.91	20.44 $\pm$ 1.65	2.72 *
In % of HEAD LENGTH					
Snout	20.00-28.57	24.22 $\pm$ 2.29	16.67-27.27	22.20 $\pm$ 2.38	3.59 *
Eye	22.22-33.33	28.82 $\pm$ 3.04	20.00-33.33	29.30 $\pm$ 3.08	0.65
Head height	53.85-73.33	63.36 $\pm$ 4.53	50.00-66.67	58.58 $\pm$ 3.63	4.03
Head width	70.59-93.33	77.61 $\pm$ 6.11	55.00-76.92	70.00 $\pm$ 4.61	5.83
Post-orbital	45.45-56.41	52.09 $\pm$ 2.76	46.15-55.00	50.79 $\pm$ 3.44	1.73
MERISTIC COUNTS					
Segmented dorsal rays	9		9		
Segmented anal rays	8		8		
Pectoral rays	21-22	21.67 $\pm$ 0.48	21-22	21.50 $\pm$ 0.50	
Pectoral free rays	5		5		
Caudal segmented rays	17		17		
Scales along the body	35-36	35.25 $\pm$ 0.44	35-36	35.39 $\pm$ 0.55	
Transverse scale series	14-15		14-15		
Predorsal scales	13-21	17.48 $\pm$ 2.38	13-21	18.31 $\pm$ 2.28	

\* Significant at 5% C.L.

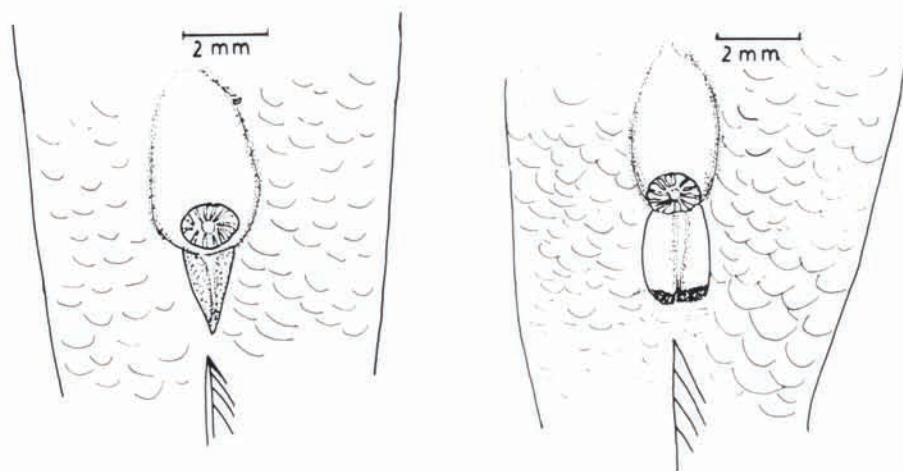


Fig. 6: Genital papillae of the males (left) and females (right), 56 mm SL.

with minute dark spots; pectoral with five rows of white spots on rays when alive, become dark in formaline when preserved; caudal with 5-6 rows of dark spots, membrane with minute dark spots; anal fin with minute spots; pelvic fins dark. A dark blotch at base of upper free pectoral rays and an anterior one behind eye; an indiscernible dark spot behind upper corner of the opercle.

### Discussion

Although the genus *Bathygobius* badly needs revision and clarification of the status of some of its species, it appears that *B. karachiensis* can easily be distinguished from the other Indo-Pacific *Bathygobius* species (as listed in the introduction). The species group which includes *B. karachiensis*, *B. cotticeps*, *B. cyclopterus* and *B. hongkongensis* differs from their congeneric species by having a continuous oculoscapular canal (4 supra opercular pores), while in all other species the anterior and posterior oculoscapular canals are separated (5 supra opercular pores). *B. karachiensis* can be distinguished from *B. cotticeps* and *B. cyclopterus* by lacking scales on opercle. From *B. hongkongensis* it is distinguished by the followings: higher branchiate of the free pectoral rays (20-25 free tips in *B. karachiensis* against 14-18 in *B. hongkongensis*; curved posterior edge of mental flap in *B. karachiensis* against almost straight edge in *B. hongkongensis*; the location of the anterior temporal pore (about mid way between the posterior temporal and posterior otic pores in *B. karachiensis* while in *B. hongkongensis* it is much closer to posterior otic pore than to posterior temporal pore; wider interorbital space (45-55% in *B. karachiensis* against 18-23% in *B. hongkongensis*; slightly higher count of scales along the body (35-36 in *B. karachiensis* against 33-34 in *B. hongkongensis*).

In addition to the sexual dimorphism expressed by the genital papillae, there are some statistically significant differences between the sexes. As evident from table 1 these differences are expressed mainly by the size of the fins, which are longer in males. All other counts and measurements of both sexes do not show any significant differences.

**Acknowledgements.** - We are grateful to Dr. Christine Baer of Chauncey Belamount, U.S.A. for kindly examining the specimens of *B. karachiensis* and for her helpful suggestions. We also thank Ms. N. Paz for editing the manuscript.

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Reçu le 03.02.1989.

Accepté pour publication le 04.04.1990.